ANIMAL BREEDING SYSTEM

The present invention relates to a breeding system for animals, in particular pigs, kept in a free-range herd for use in an open air or outdoor environment. The system comprises a) means for automatic and electronic registration of data for the individual animals, b) means for controlled and individually regularly feeding of the animals based on the recorded data of each animal, c) an open-air field area wherein the means a) and b) are arranged, d) means for recording the registered data of each animal in a registration unit, e) optionally a facility for slaughtering the animals, f) optionally at least one device for containing water, a so-called "mud-hole" optionally connected to a waste treatment plant.

In a further embodiment, the invention relates to an arrangement for use in an open air breeding system for individual feeding of animals of a herd comprising a plurality of enclosures of a size suitable for comprising one of the animals, each enclosure having an inlet and an outlet and means for selectively switching the inlet and outlet between a for the animals passable state and a non-passable state, each enclosure also having a feeding bowl for containing feed, container means for containing a supply of feed, means for leading the feed from the container means to each of said bowls, a common inlet through which the animals may enter into each of the enclosures and means for selectively allowing animals to pass the common inlet, means for directing animals from the common inlet to a specified enclosure selected among the plurality of enclosures, and control means for controlling the operation of the arrangement.

In a still further embodiment, the invention relates to a method for feeding porkers of a herd, each porker being uniquely identifiable by means of identification means, comprising the steps of identifying one of the porkers and transmitting the identification to a control unit, allowing the porker into a feeding enclosure in which it is the sole porker, feeding the porker in the feeding enclosure, and allowing the porker to leave the feeding enclosure, wherein each step is controlled by means of the control unit.

Breeding pigs in an open air environment, so-called free-range breeding, is connected with a number of problems and disadvantages such as problems with pollution of the environment from urine and faeces from the animals leaking to the ground. Accordingly, the environment may be loaded with nitrate as well as phosphate to an undesired degree resulting in restrictions to the farmer with respect to the number of animals per field area which may be allowable. Furthermore, the free environment makes it difficult to monitor the individual animal with respect to feed consumption, weight, health condition, heat control, time for insemination etc. The missing control of the individual animal may result in slaughtering of animals not having the optimal weight and age, waste of expensive feed, lack of quality control of the slaughtered animals, lack of practicability of phase-feeding of porkers and other disadvantages which will be evident from the further description of the invention. The free environment also makes it very difficult to isolate a specific animal from the other animals when desired which result in unnecessary stressing of the animal when the farmer makes attempts to catch the animal.

Porkers, herein meaning pigs that are bred for meat production, i.e. animals, that are being bred for slaughtering, are today in modern meat production fed as a bulk and individual feeding of the animals may only be provided manually. The animals are typically kept in groups of 15-20 animals. However, if the animals are kept in larger herds, more than 25-50 animals but often even much more, stronger or more aggressive animals will tend to keep other animals away from the common feeding bowls, resulting in a large deviation in size and weight of pigs of similar ages. This has the effect that a herd of porkers of similar age may reach the desired final weight over a period of several week, thus letting the production means for raising the porkers be more or less idle over most of the period. Furthermore, the feed is utilised less effectively by the porkers that are not fed properly, resulting in higher consumption of feed per kilogram meat produced. Finally, the health of the badly fed porkers may suffer from the conditions. Consequently, individually controlled feeding of the animals is advantageous as compared to known methods of feeding and may be profitable if realised in an automated manner.

Known arrangements for individual feeding of animals are expensive to purchase for a larger herd of animals, in particular arrangements wherein each animal is identified,

since each unit may only feed one animal at a time. Such arrangements take up plenty of square-metres of area relatively to the number of animals in the herd because each arrangement has a separate inlet and outlet for the animals.

Known huts for free-range breeding of pigs are generally built from light weight materials, such as sheet metal, aluminium, wood or plastic materials, and they are normally relatively small, about 6-10 m^2 and about 0,75-1,25 m in height. This is chosen in order to provide huts that may be easily moved by personnel without demanding advanced moving equipment. It is very much desired to provide movable huts. However, the light weight materials are not very resistant to wear and tear, and therefore the mean life time of the huts is reduced to about 3-4 years. In particular during movement of the huts, the load on the huts is very great, especially if a layer of hay and dirt is present in the hut, which is normally the case. Furthermore, the small size and weight of the huts may cause them to tip over and maybe even roll across the ground when strong winds are present, e.g. in the winter time. Thereby the animals are exposed to the weather, and the piglets may even freeze to death.

Furthermore, the size of the huts allows for only a limited production of pigs per hut. The capacity of a breeding ground may thus be increased if larger huts are used.

Finally, the small size of the huts, in particular the height, creates a bad working environment for the personnel. They are not able to stand up inside the hut, and since most huts have only one exit, a sow may block the exit when a person is inside the hut, and the sow may at the same time bite the person or squeeze him or her, thereby causing fractures or other injuries.

The insulation of the known huts is limited, typically with a heat transfer coefficient of approximately 0,69 $W/(m^2 \cdot K)$. In cold weather the air circulation of the hut is therefore reduced to a minimum in order to prevent the cold air from the outside from entering the hut. Furthermore, the pigs will "lump together" in order to keep warm. Thus, the air inside the hut tends to get humid, which may cause respiratory infections to the animals, and the larger and stronger animals may keep the smaller and less strong animals away from the best positions, or they may even lie on top of them, whereby the smaller animals may suffocate.

The above-mentioned problems are of special importance for out-door breeding of porkers, which presents the added problem of the exposure of the animals to the temperature and wind speed variations of the open air environment, calling for adjustment of the amount of feed.

WO 96/199912 relates to an arrangement for managing a herd of freely walking animals being cows or other animals for milking. The system comprises a milking station located in a receiving area and a milking stationfollowed by a separation area in case the cow should be excluded due to illness. As separation due to illness may be followed by a treatment which again may be a bad experience for the cow, she may not enter the milking station afterwards as frequently as desired. The problem disclosed in the document is to permit treatment of an animal without negatively influencing a desired behaviour of the animal. The problem is solved by an arrangement where the cow leaving the milking station is led back to the receiving area where there are feeding means and where the cow is free to enter the separation device. The document mentions use of identification means, feeding means, control means for controlling the state of the gates to be used with the milking station and the connected receiving area and separation area. However, the system does not relate to means for controlled and individually daily feeding of the animals based on the recorded data of each animal.

US Patent No.5,673,647 relates to an automated method and system for providing individual animal electronic identification, measurement and value based management of cattle i a large cattle feedlot. Animals are individually identified and measured by weight, external dimensions and characteristics of internal body tissue. The individual identification and registration of the cattle with respect to physical and other information is used for calculating the optimal time for slaughtering. There is no mentioning of an individual feeding of the cattle or feeding means and the cattle are fed directly on the ground in the herd.

DE 3701864 A1 relates to indoor handling of pigs, particular sows. The document mentions registration of data on the sows including the weight which are used to determine the desired amount of food probably by use of standard feeding keys for

sows. In fact the invention relates to a specific feeding/separation system where the sow after separation is transported (on a wagon) to a feeding box. It is mentioned that the system may also be use for porkers. There in no teaching of an outdoor breeding system.

GB 2 232 053 relates to a system for feeding free-range sows provided with a transponder each. The system comprises an antenna which registers passing sows and communicates with a computer which selects whether the sow should be fed. In such case the sow is allowed entrance to a receiving area in front of the feeding machines. There is no mentioning of individual feeding of the sow which receive a standard portion of food.

WO 91/03930 relates to a system for electronic identification of an animal which also register the amount of food the animal eats from a free amount of food.

Description of the invention

It is an object of the present invention to provide a breeding system for breeding animals, in particular pigs, in open-air, free range conditions, in a highly automated way to ensure low requirement of manual labour and at the same time to ensure a throughout surveillance of the animals, so that the animal breeding is economically sound, environmentally and ecologically advantageous and provides potential for the best animal welfare.

Even though the following description relates to a breeding system for pigs it is within the scope of the present invention to use a system adapted for sheep. The skilled person would, based on the present invention and description thereof, be able to perform the relevant modifications with respect to the dimensions of shelters and other means described in detail below so that the system would be operable for sheeps.

The present invention relates to a breeding system for use in an open air environment for a number of animals, preferable for pigs, and comprises

a) means for automatic and electronic registration of data for the individual animals,

b) means for controlled and individually regularly feeding of the animals based on the recorded data of each animal,

c) an open-air field area wherein the means a) and b) are arranged,

d) means for recording the registered data of each animal in a registration unit,

e) optionally a facility for slaughtering the animals,

f) optionally at least one device for containing water, a so-called "mud-hole" optionally connected to a waste treatment plant.

By regularly is normally and preferably understood about once a day, ranging from three feedings per week to two-three feedings per day. The interval between the feedings may be a more or less constant interval of time such as 36 hours or may be of regular pattern of e.g. 24/12/24 hours. The interval may also be adapted to the outdoor temperature, as a more frequent feeding may be needed in cold weather. By use of a control system as disclosed in connection with the present invention, such individual regularly feeding of each individual animal is made possible in that a specific interval of feeding may be programmed for each animal.

Where preferred, the open-air field is enclosed by a fence. The fence may be adapted to the specific animals. However, as the animal will receive regular feeding, it is very likely that the animal will return to the feeding area voluntary. In other situations, the field area may be such that the field area has natural borders such as rivers or the like. Accordingly, the field area may include parts of forest or other suitable habitats for breeding the animals.

In a preferred embodiment, the breeding system further comprises means for automatically identifying each of the individual animals, this identification allows different handling of each animal. Any specific handling or control of each individual animal is also relevant in connection to the possibility of isolate the identified animal, Accordingly, in a still further embodiment the breeding system according to the present invention may further comprise means for automatically separating and/or isolating an identified animal from one or more of the other animals. Apparently, the

means for identifying the animal may be integrated with the means for automatic and electronic registration of data for the individual animals.

In another embodiment, the means for separation and/or isolation is integrated with the means for controlled and individually regularly feeding of the animals based on the recorded data of each animal.

In a further aspect the breeding system comprise means for providing shelter for the animal such as a hut.

The means for providing shelter or the hut is preferably a construction which is simple and movable so that it is easy to shift between field areas. As described in detailed in connection with the figures, the present invention preferably utilises a basic shelter construction which is modified according to the specific use.

The shelter or hut may be in the form of a standard hut for providing shelter for sows without pigs or for porkers which both are able to live together in a shelter without any special arrangements of the shelter. Accordingly, in one embodiment, the dimensions of a standard shelter as the one described in connection with the figures is modified to conform with the desired number of animals for which the hut provides shelter.

If the shelter is for farrowing sows, the shelter or hut is equipped with one or more, preferably two, sow retainers allowing handling of the farrowing sow if desired. The shelter for farrowing sows also comprise an area wherein the piglets are protected from the sow. Accordingly, the shelter is preferably separated in such a way that the piglets may find a safe space but still be within the sight of the sow. The separation may be due to a low roof in one side of the shelter. The piglets will automatically search the safe area if a heating lamp is placed in the shelter area for the piglets. The safe area prevents the killing of the piglets if the sow is laying down on the piglets.

The means for providing shelter for the animals may also include a family hut for pigs adapted for housing at least one sow with piglets of the age up to about 6-7 weeks, the hut being divided into at least two parts, one part allowing the piglets to be

separated from another part housing the sow or sows. The separation may for this instance be by means of e.g. a separating sheet with an opening having such dimensions that the sows, but not the piglets, are prevented from passing through the opening.

In a further embodiment, the means for providing shelter for the animals further comprises a feeding hut for pigs adapted for feeding the pigs by a transponder-feeder. In this case, the hut comprises an inlet door and an outlet door and optionally a gate between the inlet and outlet doors preventing the animal from leaving the hut through the inlet door. Generally, the feeding hut is isolated from the huts providing shelter for the animal during the night and in cold weather such as the farrowing hut and family hut described above.

The shelters are substantially provided with isolated shelter walls, are preferable movable in one piece. In addition the shelters are generally without any floor which also enables easy handling and moving of the shelters. The shelters may be placed directly on the ground. Furthermore, the shelters are optionally provided with ventilation means such as windows.

A very important aspect of the invention is the means for automatically identifying an individual animal. This means relates in its general form to a mark or a label connected to the animal, the means may also include more sophisticated systems such as a barcode or iris-identification means. The means for identification comprises or is capable of obtaining information relating to the pig and which is automatically registered by a registration unit located e.g. in connection with a feeding hut or in connection with the means for automatically separating and/or isolating an identified animal from one or more of the other animals.

Preferably, the individual animal comprises a label or a mark fastened on the animal, such as on the ear. The animal may have more than mark, e.g an mark en each of the ears in that the mark may follow the slaughtered animal to the consumer. In case it is desired to trace the animal, the mark or a minor part of the mark still be present with the final product may be used for that purpose.

The registration unit is in one embodiment activated by the presence of the animal bearing the mark when the animal is located in or is entering a feeding hut such as the one described above.

The purpose of identifying the individual animal is for example for providing the individual animal with a controlled and specific amount and/or mixture of feed based on the identification of the animal. It is within the definition of a controlled feeding according to the present invention to provide an individual animal with feed ad libitum when desired. In particular, the system may comprise means for determining the weight of an identified animal, and the specific amount and/or mixture of feed may be determined in response to the weight of the animal. This is especially advantageous for individual feeding of porkers, so that an individual animal being below an average weight for its age may be fed an extra supply.

The system according to the present invention is also capable of identifying animals which for some reasons do not get the expected predetermined amount of feed within a predetermined period of time, as the identifying system may register whether all animals recognised by the system have visited the feeding hut.

In general, the monitoring, registration and control of the animals are preferably performed with standard equipment, such as ear transponders, stationary and hand held transceivers for communicating with the transponders, means for temperature registration, means for marking the animals, means for measuring the thickness of the fat layer on the back of the porkers, weights etc. This equipment is commonly commercially available and may by purchased from a number of producers, such as Schauer (Switzerland), Laprova (Denmark) or SKIOLD datamix a/s (Denmark) and other manufacures.

In a further embodiment of the breeding system according the invention, the means for automatically separating and/or isolating an identified animal from one or more of the other animals is a separation hut comprising an inlet door for an animal entering the hut and means for directing the animal towards one of at least two outlet doors. The number of outlet doors is easily adapted to the number of groups of animals which should be isolated or separated. The separation may be desired based on

health, heat of the animal, weight, body temperature, fat content, feed consumption, etc. which is registered in connection with the identified animal. The registration method may also include videotaping or photography which may be handled digitally in the system. The separation is easily performed by a turnable fence which is driven automatically and based on the information received about the individual animal by the separation system and which directs the animal towards the desired outlet door.

As the pigs in warm weather above 10°C-12°C need to cool down, a breeding system according to the present invention may also include a mud-hole. In addition, the pigs prefer to deliver urine and faeces to a wet area and this is utilised by an arrangement of a mud-hole on the field so that the animals leaving the shelter (in the morning) will enter the mud-hole on their way to the means for controlled feeding. Thereby the urine and faeces from the pigs are substantially isolated in the mud-hole. In a preferred embodiment the mud-hole is movable.

In one embodiment the mud-hole has such dimensions so that it may contain at least one of said animals and having a design so that said animals are able to enter and leave the mud-hole, the mud-hole being substantially isolated in its lower part from the field with a barrier so as to substantially prevent substances including the urine and faeces contained in the mud-hole from leaking to the environment.

The mud-hole may in a further embodiment be provided with draining means for discharging parts of the contents of the mud-hole, the system further comprising connecting means, such as a pipe or a tube, connected to the draining means for leading the discharged part from the mud-hole. In a preferred embodiment, the mud-hole is connected to a waste-water treatment system, such as a natural reedbed, wherein the waste-water treatment system is connected to the mud-hole through the draining means for receiving the discharged part from the mud-hole. A most suitable waste-water treatment system for water containing urine and faeces is manufactured and sold by Bioscan A/S, Denmark.

The invention further relates to a mud-hole for use in a breeding system as described herein and having such dimensions so that it may contain at least one of said animals and having a design so that said animals are able to enter and leave the mud-hole, the

mud-hole being substantially isolated at a lower part from the natural environment with a barrier so as to substantially prevent substances contained in the mud-hole from leaking to the environment.

A conventional reedbed system known in the art consist of waste water flowing over or through the substrate, such as sand, gravel or soil, in which the reeds are growing. A conventional reedbed system may be of the type of a horizontal flow system, in which-waste water flows across the reedbed comprising suitable plants. Waste water is then fed in an inlet in one end of the system and flows slowly across the bed in a horizontal path until it reaches the outlet at the opposite end of the flow system.

In a further embodiment, a breeding system according to the present invention also comprises facilities for slaughtering the animals, the facilities being positioned within or in close proximity to the fenced-in open air field area, preferably as mobile facilities, so that the time for transportation of the animals is limited to the degree possible as stressing of the animals diminish the quality of the meat. Accordingly, the facilities for slaughtering the animals is positioned at a distance to the place where the animals are living so that the time period for transportation of the animals from their living place to the facilities by ordinary transportation means, such as by a truck, does not exceed 30 min. including loading and unloading the animals onto and off the transportation means.

In order to minimise the pollution of the environment, the facilities for slaughtering the animals comprise means for collecting the waste from the slaughterhouse.

The breeding system may be adapted to comprise between 25 and 100.000 animals but each unit within which the animals constitutes a single herd preferably comprises between 25 and 1000 animals which is suitable for limiting the spreading of diseases. As will also be clear from the following description, the system according to the present invention involves a selection of the embodiments described such as a selection of the described huts for providing shelter for the relevant group of animals living together in a single field area only separated with suitable fences.

Thus, in one embodiment the present invention regards an arrangement for individual feeding of animals of a herd comprising

a plurality of enclosures of a size suitable for comprising one of the animals, each enclosure having an inlet and an outlet and means for selectively switching the inlet and outlet between a for the animals passable state and a non-passable state, each enclosure also having a feeding bowl for containing feed,

container means for containing a supply of feed,

means for leading the feed from the container means to each of said bowls,

a common inlet through which the animals may enter into each of the enclosures and means for selectively allowing animals to pass the common inlet,

means for directing animals from the common inlet to a specified enclosure selected among the plurality of enclosures, and

control means for controlling the operation of the arrangement.

Advantageously, the arrangement comprises means for performing a unique identification of each animal of the herd, the means being arranged so as to allow for identification of an animal before letting it into the arrangement. The identification is performed automatically and the identification means on each animal may be the eyes or other natural but unique characteristic of the animal or it may be a mark bearing a code, such as a visual code like a bar code, a letter code or other visual signs. However, in a preferred embodiment, the arrangement comprises

a plurality of transponders each having a unique identification code, each animal of the herd being equipped with a transponder for individual identification, and

a transceiver for reading the identification codes of the transponders, the transceiver being arranged near the common inlet so as to allow for identification of an animal before letting it into the arrangement.

The arrangement may further comprise an inlet enclosure of a size suitable for comprising one of the animals, the common inlet forming the inlet of the inlet enclosure, the inlet enclosure having means for selectively allowing an animal within the enclosure to leave the inlet enclosure and having means for determining at least one of the following characteristics of each identified animal passing the common inlet and for transmitting the at least one characteristic to the control means:

a) the weight of the animal,

b) the skin temperature of the animal measured from the infra red radiation from the animal,

c) the body temperature of the animal measured by means of a sensor mounted on the animal, and

d) the thickness of the fat layer on the back of the animal, optionally measured by use of an ultra sound sensor.

The arrangement may also be equipped with electronic cameras for video or still pictures for supporting remote surveillance and control of the arrangement.

Furthermore, the arrangement may further comprise means for selectively separating identified animals having passed the common inlet to at least one separation enclosure. The reason for separation may be that the animal is to be slaughtered, is ill or, if the herd comprises sows, is in heat and should be inseminated, is about to farrow etc.

The plurality of enclosures of the arrangement may, in order to save area and for efficient use of the equipment, be arranged on a platform, the arrangement having means for rotating the platform, preferably at a constant angular speed, wherein switching between the passable state and the non-passable state is being provided by the rotational movement of the platform. For such an arrangement, the opening defining the inlet of each enclosure is also advantageously defined by the outlet of said enclosure.

In a simple version, each animal is allowed to eat the amount it desires when being alone in the feeding enclosure. However, in a preferred embodiment of the invention, the control means controlling the operation of the arrangement may control the amount of and optionally the type of feed supplied to the individually identified animal. The type of feed may be a mixture of different types of feed supplied from a number of feed containers. Preferably, the amount of feed is adjusted so that the porkers need to find about 10% of the daily feed intake out in the field to assure that each animal is properly exercised which increases the quality of the meat.

For outdoor breeding of pigs, the supply of feed to the individual animal should be adjusted according to the environmental condition. Thus, the arrangement may comprise means for adjusting the amount of feed supplied to the individual animal according to the temperature and optionally the wind speed the animals are subjected to.

The arrangement may be used for several types of animals, such as sheep or pigs, but the arrangement according to the invention is in particular suitable for individual feeding of pigs, especially porkers.

Furthermore, the invention regards a method of feeding porkers of a herd, each porker being uniquely identifiable by means of identification means, comprising the steps of

identifying one of the porkers and transmitting the identification to a control unit,

allowing the porker into a feeding enclosure in which it is the sole porker,

feeding the porker in the feeding enclosure, and

allowing the porker to leave the feeding enclosure,

wherein each step is controlled by means of the control unit.

Preferably, each porker is equipped with a transponder having a unique identification code and the identification step comprises the step of reading the identification code of the transponder of one of the porkers with a transceiver.

The method may also comprise the steps of

determining an individual amount of feed for each porker by means of the control unit, and

feeding each porker the determined individual amount of feed when the porker is present within the feeding enclosure.

At least one of the following characteristics of each identified porker may in a preferred embodiment of the invention be determined and stored in storage means of the control unit:

a) the weight of the porker,

b) the skin temperature of the porker measured from the infra red radiation from the animal,

c) the body temperature of the porker measured by means of a sensor mounted on the porker, and

d) the thickness of the fat layer on the back of the porker.

If at least the weight of the porker is determined, the amount of feed fed to the individual porker may be determined from the weight of said porker. The amount of feed fed to each porker may additionally or alternatively be adjusted for the air temperature and optionally for the wind speed the porkers are subjected to. The general condition of the individual animal may also be used as a parameter for adjusting the amount of feed.

The method may further comprise the steps of

determining whether an identified porker should be separated from the herd by means of the control unit, and

activating separation means by means of the control unit so as to separate said porker into a separation enclosure. If at least a temperature of the identified porker is determined, the separation of the identified porker may be effected in response to the determined temperature of said porker.

The control unit may according to the invention at least temporarily be connected via a data communication network to a remote surveillance system whereby the operation of the control unit may be remotely monitored and at least partially controlled. The data communication network may include local network, private and public network, wide area network and also include communication by satellite and mobile telephone or any combination of the above mentioned network or means for communication.

Information in the control unit may be provided to external parties, such as farming consultants, vets, slaughterhouses, banks etc. The system is preferably protected against abuse by applying individual passwords for every party who may gain access to the system.

In case a slaughterhouse subscribes to the service it may use the information obtained as a basis for production planning. They may, e.g., order and/or collect selected pigs.

The selection may, e.g., be based on the weight of and/or the thickness of the fat layer on the back of the individual pig, on the temperature registrations of the animals, i.e. have they been ill, and/or whether they have been given medicine.

The described arrangement and method of the invention for individual feeding of animals may be used independently, but are preferably used with the arrangements for breeding animals such as sheep or especially pigs as described herein.

It is an important aspect of the present invention that the control system is permanently or temporarily connected over a communication network with a surveillance system from which the function of the system may be surveyed and at least partially controlled. Accordingly, any step of breeding the animal may be surveyed and/or controlled by any person or institution which have been allowed entrance to the system. The institution may include control institutions such as the organisations for animal welfare or governmental institutions. However, the system is especially adapted for persons directly involved in the breding such as the farmer(s), one or more controller(s), a veterinarian, one or more investor(s), a slaughterhouse, a food supplier or any other person which may have interest in knowing the status of the system. Possible interactions of persons related to a breeding system according to the present invention appears from the diagram disclosed in Figs. 27-30.

Brief description of figures

Fig. 1 shows a standard hut seen from the side,

Fig. 2 shows a standard hut seen from one end,

Fig.3 shows a cross-section of the standard hut,

Fig. 4 is a sketch of the ventilating air flow of the standard hut,

Fig. 5 shows the interior of a farrowing hut,

Fig. 6 shows the interior of a family hut,

Fig. 7 shows the interior of a shelter hut,

Fig. 8 shows the interior of a transponder-feeding hut,

Fig. 9 shows the interior of a separation hut,

Fig. 10 shows a watering hut,

Fig. 11 shows a feeding hut,

Fig. 12 shows a first part of a mobile slaughterhouse,

Fig. 13 shows a second part of a mobile slaughterhouse,

Fig. 14 shows the first and second parts of the slaughterhouse put together to a single unit,

Fig. 15 a) and b) shows a mobile mud-hole,

Fig. 16 shows the arrangements on a field of type A,

Fig. 17 shows the arrangements on a field of type B,

Fig. 18 shows the arrangements on a field of type C,

Fig. 19 shows the arrangements on a field of type D,

Fig. 20 shows the arrangements on a field of type E,

Fig. 21 is a flow-chart showing modifications in standard software for implementing heat control,

Fig. 22 is a flow-chart showing modifications in standard software for implementing fertilising control in case of late weaning of piglets,

Fig. 23 is a flow-chart showing modifications in standard software for implementing phase-fed porkers in automatic systems,

Fig. 24 shows an elevated view of an arrangement comprising separation equipment and a feeding carrousel,

Fig. 25 shows the arrangement of Fig. 24 placed within a feeding hut, and

Fig. 26 shows a cross-section of the arrangement of Fig. 25.

Figs. 27-30 shows a diagram disclosing the interconnection of different parts of a free range production of porkers.

Detailed description of figures

The figures 1-26 illustrates a number of embodiments and details of a breeding system according to the invention.

Buildings for a free-range breeding system

A number of buildings and other constructions that may be used for a breeding system according to the invention are shown in Figs 1-15. These buildings and constructions are suitable for the breeding system but similar arrangements may also be applied. The buildings to be placed on the fields are preferably mobile which means that they may be moved from one field to another without excessive dismounting from the field. The reason for this demand is that crop should be grown on the fields every second year

according the present official regulations, at least in Denmark, for environmental reasons.

A standard hut 1 is shown in Figs. 1-4 and a number of modifications of this standard hut 1 to be used for specified purposes are shown in Figs. 5-11. The outer of the standard hut 1 is shown seen from the side in Fig. 1 and from one of the ends in Fig. 2 with the outer measures indicated in millimetres. The hut 1 is at each end, see Fig. 2, provided with a window 2 to enable ventilation of the hut 1 and to let daylight into the hut 1. The window 2 is hinged at the bottom and may be opened inwardly and locked in four different positions. The window 2 is preferably comprising two layers of transparent plastic or of glass which is relevant during periods of cold weather. The two layers reduce the loss of heat from the window 2. The hut 1 is also at each end provided with a door 3 in two parts. The upper part 4 of the door 3 is insulated on the inside with 50 mm insulation material and the lower part 5 of the door 3 may have an opening suitable for allowing passage of animals below a certain size. The hut 1 is open at the bottom. A cross-section of the standard hut 1 shown in Fig. 3 illustrates the construction of the hut 1.

The construction comprises a frame 6 made of square steel tubes of dimensions 100 x 100 x 3 mm but tubes of smaller dimensions may also be used. The tubes are welded together to make a solid frame for the hut 1. 47 x 100 mm laths 7 are mounted on the frame 6 and the material forming the walls is fastened to these laths 7. The walls are, from the outer side to the inner, made of 25 mm x 100 mm cross-section compreg boards 8, 100 mm rock wool or other insulating material 9, a 0.15 mm plastic membrane 10 to prevent moisture from the inside of the house from condensing on the outer part of the insulation 9, and a 12 mm plywood sheet 11. The roof comprises a number of 100 x 47 mm laths 12 on which 0.4 mm polyester-coated steel plates 13 are mounted. The roof is insulated with 200 mm rock wool or other insulating material 14.

The compreg boards 8 and the steel plates 13 are preferably of a light green colour to give a harmonic overall view of the animal-breeding arrangement in the environment. A movable part 15 of the ridge may be elevated to provide ventilation of the hut 1. The movable part 15 of the ridge may be supported in the elevated state by a metal

rod or by a hydraulic system and the elevation may either be performed manually or be controlled automatically according to the temperature and/or moisture inside the hut 1 or according to other parameters. Such a system may optionally also control the opening of the windows 2. Pigs, which are the preferred animals to be bred in the described breeding system, are sensible to draught but are also sensible to high temperatures and dust, for which reason the hut 1 is preferably adapted for ventilation. Draught along the floor where the pigs are situated is prevented by ventilating the hut 1 by opening the windows 2 and/or the movable part 15 of the ridge. The flow of air with the windows 2 and the movable part 15 of the ridge open is illustrated with the arrows in Fig. 4.

The chosen construction materials have a high durability, requires a minimum of maintenance and are easy to clean with a pressurised hot water cleaner. The compreg boards 8 may be replaced with thin steel plates such as those used for the roof which would make the construction lighter and less expensive. The outer measures of the standard hut 1 may also be changed to be in accordance with the standard sizes of containers, 20, 30 or 40 feet.

The standard hut 1 preferably has an area of between 10 m^2 and 20 m^2, such as between 12 m^2 and 16 m^2, such as approximately 14 m^2, thereby allowing approximately 25 porkers or 8 sows to accommodate the hut 1. Thus, a smaller number of huts 1 is needed for producing a certain number of porkers than is the case for known arrangements.

The height of the standard hut 1 is preferably at least 1,80 m, thus allowing personnel to stand up when being inside the hut 1, thereby improving the working environment for the personnel as compared to known huts.

The weight of the standard hut 1 is preferably between 1500 kg and 2500 kg, such as between 1700 kg and 2200 kg, such as approximately 2000 kg, and it is preferably adapted for being moved by means of a truck or other similar moving means. The standard hut 1 may optionally be provided with wheels or other equivalent means, so that it may be pulled by, e.g., a tractor or a similar vehicle. Thus, more attention has been directed to durability than to weight when the materials were

chosen. The mean life time of the standard huts 1 is thus approximately 10 years. Furthermore, the standard hut 1 is very unlikely to be tipped over by strong winds.

The insulation of the standard hut 1 is better than the insulation of the known huts with heat transfer coefficients of approximately 0,20 W/(m^2·K) for the roof and approximately 0,33 W/(m^2·K) for the walls. Due to the better insulation and due to the fact that more pigs are kept together in the same hut 1, it is possible to keep a constant ventilation in the standard hut 1. Thereby a desired temperature, most preferably a constant temperature, as well as a desired humidity may be kept in the standard hut 1, thus reducing the risk of respiratory infections of the animals. Furthermore, the problems arising from the "lumping together" of the animals are eliminated, or at least reduced considerately.

The hut 1 may furthermore be provided with an opening in a side wall for accommodating a tube through which bedding such as straw may be blown. The bedding for the animals may thus be provided mechanically with a straw blower instead of providing it manually, thus saving manual work.

A first modification of the standard hut 1 is the farrowing hut 16 shown in Fig. 5 as seen from above. The farrowing hut 16 may accommodate two farrowing sows for which reason the hut 16 is divided in two parts with a 12 mm plywood sheet 17.

Each of the two parts of the farrowing hut 16 comprises a sow retainer 18, supply of drinking water 19, 20 for the sow and for the piglets, respectively, a 500 W heating lamp 21 for the piglets and a piglet shelter 22 where the sow cannot enter due to a low roof of the piglet shelter 22. The heating lamp 21 and the piglet shelter 22 are arranged so that the sow may see the piglets all the time when the sow is the sow retainer 18. The sows may enter and leave the hut 16 by the lower parts 5 of the doors 3.

The sow retainers 18 prevent the sows from lying on the piglets having already been born during the farrowing. The sow retainers 18 further allows personnel to get close to the sows during the farrowing in order to help the farrowing sows. Farrowing sows

are known to be very aggressive, so it is very difficult to approach them if they are not retained in one way or another, since the sows may injure the personnel.

A second modification of the standard hut 1 is the family hut 23 shown in Fig. 6 for up to four sows with piglets until the piglets are 6-7 weeks old. The family hut 23 is divided in two parts with a 12 mm plywood sheet 24, the smaller part, approximately one third of the hut 23, being used by the piglets. The plywood sheet 24 is preventing the sows from entering the piglets part of the hut 23 but it is provided with one or more openings at the bottom large enough for the piglets to pass to and from the sows part of the hut 23. Likewise, the lower part 5 of the door 3 at the piglets side of the hut 23 is provided with an opening large enough only for the piglets to pass. The family hut 23 has supply for drinking water 25, 26 for the sows and for the piglets, respectively.

In the family hut 23 the piglets are weaned. The weaning takes place gradually, since the sow is still present. This reduces problems with diarrhoea, and it is therefore not necessary to give antibiotics to the piglets. Furthermore, the load on the sows is reduced, since the piglets start eating feed at an earlier time than is normally the case. The sows are therefore more fit to bear a new litter.

The third version of the standard hut 1 is a shelter hut 27 shown in Fig. 7 for providing shelter to sows without piglets or to porkers. This version does not comprise a floor.

A fourth modification of the standard hut 1 is the transponder-feeding hut 28 for sows with means for registration and separation of the sows. The transponder-feeding hut 28 has an inlet door 29 for letting the sow enter the hut 28, a gate 30 that closes behind the sow to prevent it from leaving the hut 28 through the inlet door 29, two fences 31, 32 to retain the sow within the feeding box, a transceiver 33 for communicating with the transponder preferably placed on the ear of the sow, a turnable feeding bowl 34 and two outlet doors 35, 36. The transponder-feeding hut 28 further comprises one or more containers for feed, means for leading the feed to the feeding bowl 34, motors or similar means for turning the feeding bowl 34 and for closing the gate 30 and a control unit for controlling the different functions, such as a

Personal Computer (PC). The transponder-feeding hut 28 may further comprise means for marking the sows with e.g. spray paint, means for dosing medicine to the sows, means for determining the weight of the sow and/or means for registration of the body temperature of the sow, such as an infra red sensor. The functions may be integrated, so that e.g. the feeding bowl 34 is placed at one end of a plate on which the animal is weighted. The body temperature of the sow may also be registered with a sensor placed on the transponder. The registration of the body temperature serves both the purpose of determining whether the sow is ill and whether the sow is in heat. The transponder-feeding hut 28 may also comprise other means for determining whether the sow is in heat.

The transponder-feeding hut 28 is primarily used for automatic feeding of the sows according to their individual needs and for separation of sows for various reasons, such as illness of the animal, for insemination, for slaughtering or other reasons. The hut 28 may also be used for registration of the body temperature of the sow, to determine the weight of the sow, for administration of medicine to the sow, for marking the sow with paint etc. The hut 28 may also be provided with more than two outlet doors for enabling separation into more than two groups.

The events and functions of the transponder-feeding hut 28 are listed in Table 1.

Event	Primary function	Secondary function
Sow enters the transponder-feeding hut 28 and approaches the feeding bowl 34	The gate 30 is closed behind the sow to prevent the sow from leaving and other sows from entering the hut 28	
Sow puts its head into the feeding bowl 34	Transponder is identified by the transceiver 33	The body temperature of the sow may be registered (optional)
Sow eats and keeps its head into the feeding	Feed according to the sows feeding programme	Medicine may be administered into the feed

Event	Primary function	Secondary function
bowl 34	is led into the feeding bowl in portions	(optional). Other measures of whether the sow is in heat (optional). Marking of the sow with spray paint (optional)
Sow has finished eating and moves the head out of feeding bowl 34	The feeding bowl 34 is turned either right or left if the transceiver 33 does not obtain response from the transponder for more than 20 seconds	The PC controls to which side the bowl 34 is turned depending on whether the sow should be separated
Sow leaves hut 28 through outlet door 35 or 36 to field or separation area	The gate 30 is opened 30 seconds after the feeding bowl 34 has turned to let the next sow into the hut 28	The next sow may push the previous one out if it does not leave by itself

Table 1: Events and functions of the transponder-feeding hut

A fifth modification of the standard hut 1 is a separation hut for determining the weight of and separating the porkers. A separation hut 37 is shown in Fig. 9. The separation hut 37 comprises an inlet door 38, a first gate 39, a weight 40, a transceiver 41 for communicating with the transponder e.g. placed on the ear of the porker, a second gate 42, two fences 43, 44 to retain the porker within the weighting box, three turnable fences 45, 46, 47 for directing the porker towards the selected outlet door. The separation hut 37 is here shown with three outlet doors 48, 49, 50 for enabling separation of porkers into three different areas but the number of groups into which the porkers can be separated may be as desired. The separation hut 37 may further comprise means for measuring the thickness of the fat layer on the back of the porkers, means for marking the porkers with e.g. spray paint and/or means for registration of the body temperature of the porker, such as an infra red sensor. The

body temperature of the porker may alternatively be registered with a sensor placed on the transponder. The body temperature serves as an indicator for whether the animal is ill. Additionally, the separation hut 37 may comprise electronic cameras for providing video pictures or still pictures of the animals and means for transferring these pictures to a surveillance system in order to support remote surveillance and control of the separation hut 37 and the whole system.

The separation hut 37 is primarily used for registration of the weight of the porkers (or sheep in case of a breeding system for sheep) and for separation of porkers for various reasons, such as separation due to illness or separation for slaughtering. Each porker on a field passes the separation hut 37 at least once a day and the capacity of the separation hut 37 is about 500-1500 porkers per day or even more. The separation hut may also be used for separating the porkers to different feeding places with different feed according to the weight of the individual porker, a so-called phase-feeding programme where different sizes of porkers are mixed on the same field. The phase-feeding programme is described elsewhere in this document.

The events and functions of the separation hut 37 are listed in Table 2.

Event	Primary function	Secondary function
Porker enters the separation hut 37	The first gate 39 is closed behind the porker to prevent it from leaving and other porkers from entering the hut 37	
Porker approaches the second gate 42 which is locked	Transponder is identified by the transceiver 41	Body temperature of porker may be registered (optional). Marking of porker with spray paint (optional). PC controls the position of the turnable fences 45, 46, 47
Second gate 42 is	First gate 39 is opened	The next porker may push

Event	Primary function	Secondary function
opened, porker leaves the hut 37 through outlet door 48, 49, 50	30 seconds after the second gate 42 is opened to let the next porker into the hut 37	the previous one out if it does not leave by itself

Table 2: Events and functions of the separation hut 37

A sixth modification of the standard hut 1 is the watering hut 51 as shown in Fig. 10. The watering hut 51 is equipped with a 15 cubic metre water tank 52 and a number of drinking bowls 53 for the animals. The water tank 52 may be equipped with means for heating the water to prevent it from freezing during periods of cold weather. The approximate drinking water consumption is for porkers 18 litres/day in the summer and 9 litres/day in the winter period and for sows with piglets 30 litres/day.

In a conventional watering trough a substantial amount of bacteria may be present, especially during periods of hot weather. This problem is eliminated, or at least considerately reduced, in the watering hut 51, since the water is distributed to the animals when they need it. Therefore, the pigs do not have to drink more or less dirty and/or infected water which has been kept in a trough.

A seventh modification is the feeding hut 54 as shown in Fig. 11. The feeding hut 54 is equipped with a 15 cubic metre feed tank 55 and a feeding bowl 56 for the animals. The feeding hut 54 has no floor mounted in the area right in front of the feeding bowl 56. The ridge of the feeding hut 54 may not be elevated because pipe stubs for filling the feed tank 55 are mounted on the ridge. The feeding hut 54 has two doors 57, 58 for the porkers to enter and leave the feeding hut 54. The doors 57, 58 may optionally be one-way doors so that the porkers enter through one door and leave the hut 54 through the other in order to ensure a passing direction for the porkers. The feeding hut 54 may also be used in a simple version without the doors 57, 58 and be used for ad libitum feeding of a herd of animals.

Mobile slaughterhouse

A mobile slaughterhouse according to the invention that optionally may be used in connection with the breeding system is shown in Figs. 12-14. The purpose of using a mobile slaughterhouse is that the transportation time for the porkers from the field to the slaughterhouse and thereby the physical and mental stress on the porkers may be reduced significantly. Transport time for the porkers to the slaughterhouse should for the well-being of the animals be minimised and should be kept below 30 min.

The pigs must be slaughtered immediately after arrival to the slaughterhouse and should not be subjected to forcible means such as electric shocks from powered batons or twisting of their tails.

The mobile slaughterhouse must comply with the official regulations. These regulations are in Denmark less restrictive for small slaughterhouses than the regulations for the larger, authorised slaughterhouses. However, the small slaughterhouses have restrictions on the number of animals that may be slaughtered, not more than 100 pigs per week and not more than 5000 pigs per year and the small slaughterhouses may only supply meat for the home marked.

The mobile slaughterhouse comprises two parts, the first part for killing the animals, removal of hair etc. and removal of abdominal organs, the second part mainly for cool storage of the meat and waste from the slaughter process. All waste from the process, such as abdominal organs, waste-water etc., are either kept in the mobile slaughterhouse for later destruction or led to local destruction facilities, such as a waste-water treatment plant.

The first part 59 of the mobile slaughterhouse is shown on Fig. 12, comprising a lift 60 for lifting the pigs from the ground, a horizontal bar 61 near the ceiling for supporting the carcasses, a blood drainage bowl 62 for collecting blood from the carcass, a scalding tub 63, a cleaning unit 64 for removal of hair and cleaning of the outer surface of the carcass, a second unit 65 where the carcass is opened on the abdominal side and the abdominal organs are removed, a third unit 66 where the remaining part of the intestines, such as lungs, throat etc. are removed from the

carcass, an apparatus 67 for supplying the mobile slaughterhouse with hot water and steam and a passage 68 for the personnel of the slaughterhouse.

The second part 69 of the mobile slaughterhouse comprises a first cool storage room 70 for storing waste from the slaughter process, a unit 71 for splitting the carcass in two half parts, a second cool storage room 72 for storing the half parts of the carcass and a horizontal bar 73 for supporting the carcass.

The first part 59 and the second part 69 of the mobile slaughterhouse may be connected to a whole unit as shown in Fig. 14. An opening 74 of the first part 59 fits with an opening 75 of the second part 69 to form a passage between the first part 59 and the second part 69. The two horizontal bars 61, 73 will also fit together to form a single transportation line for the supported carcasses.

All supply of electricity, hot and cold water, compressed air, etc., to the mobile slaughterhouse is provided from a second mobile unit having a generator, water tank, etc. The second mobile unit further comprises facilities for the personnel of the slaughterhouse such as offices, bathing facilities, changing rooms, etc.

Mobile mud-holes

The fields on which the pigs are held should be provided with mud-holes where the animals can cool themselves during periods of hot weather and where they can cover their skin with a layer of mud to prevent a sunburn. It is generally recommended for the well-being of the pigs that mud-holes are established on all fields where pigs are held. The pigs will, if they do not have access to a mud-hole, try to make one themselves by wallowing on a moist area of the field.

A mobile mud-hole, according to the invention, that optionally may be used as part of the breeding system is proposed. The mobile mud-hole has a solid membrane at the bottom and sides so as to substantially prevent the contents of the mud-hole from leaking to the environment. The membrane at the bottom must be resistant to the feet of the pigs so that it will not be worn or perforated when the pigs use the mud-hole. An example of a mobile mud-hole according to the invention is shown in Fig. 15 a) as

viewed from above and in Fig. 15 b) as viewed in a cross-section. The mud-hole 76 has a chassis 77 made out of an open standard 20 feet steel-container of which the openings have closed by welding so that the mud-hole 76 may contain water. The animals may enter the mud-hole 76 from a ramp at one side 78 and leave by a ramp at the other side 79. These ramps are not shown on the figure. A platform 80 is placed inside the mud-hole 76 at the end where the animals enter and leave the mud-hole 76 and a ramp 81 is leading from the platform 80 to a part of the mud-hole 76 where the water is deeper 82, about 60 cm. The surface of the water is about 20 cm above the surface of the platform 80. The animals may use the deeper part 82 for bathing and cooling during periods of hot weather. The height of the platform 80 may be adjustable to facilitate adaptation of the mud-hole 76 to the actual size of the animals using it.

The mud-hole 76 is advantageously arranged on the field so that the pigs pass through the mud-hole 76 when they leave their shelter. Observations of pigs have shown that their elimination behaviour will be influenced by the contact with water so that they will mainly urinate but also defecate in the mud-hole 76 when they pass it, the mud-hole 76 functions therefore also as a kind of pig toilet. The latter especially takes place in the morning when the pigs leave the shelter where they have slept. The pigs need to eliminate and will, according to studies, do so at a moist area close to their sleeping area. The pigs will therefore be induced to urinate and optionally also defecate when they pass the about 20 cm deep water on their way from the shelter and to the field and feeding facilities. Furthermore, the pigs will also urinate and defecate in the mud-hole 76 when they use it for cooling and mud-bathing. The pigs are also, according to studies, induced to eliminate when they are close to other pigs in order to mark their presence on an area, for which reason the mud-holes 76 should be placed where the pigs are close to each other.

The mud-hole 76 has means for draining the contents and means for filling it with water and preferably a bowl for clean drinking water. The contents of the mud-hole 76 is frequently partly drained to a waste-water treatment plant, such as a constructed wetland etc., and the mud-hole 76 is then refilled with water. At least a part of the excrements from the pigs is in this way removed from the breeding system without loading the environment and the official field area demands for free-range pigs

for environmental reasons may therefore be reduced which is very important for the profitability of a free-range breeding system for pigs. The part of the excrements that is removed via the mud-hole 76 depends on several factors but the experiences until now show that the part is of the order of 50-70% of the total amount of excrements.

Furthermore, the mud-hole 76 may be covered with a roof or the like in order to keep rain out from the mud-hole 76 so as not to increase the volume of water to be treated in the waste-water treatment plant. The mud-hole 76 may also comprise a separate waste-water/material container that parts of the content of the mud-hole 76 may be led to and stored in, so that maintenance and emptying of the mud-hole 76 only demands infrequent human effort. In addition, the mudhole may comprise means for providing drinking water to the pigs when visiting the mudhole.

General arrangement on the field

The entire production unit comprising one or several separate fields is placed on a suitable agricultural area, preferably on marginal ground. The field is covered with grass when the pigs are let onto it, both for providing supplementary feed for the pigs and for converting the excrements from the pigs into grass so as to reduce the loading of the surrounding environment.

The production unit area is enclosed by a fence of a height of approximately 1,2 m and an electric fence, the fences must be in accordance with the regulations imposed by the relevant veterinary authorities or other official authorities, and the production unit area may be divided into several smaller fields.

The arrangement of each field depends on whether it is intended for animals porkers or sows, whether the sows are pregnant or not, or whether they have piglets.

In order to facilitate different activities in connection with the pigs, such as controlled feeding, detection of their position in the field, controlled leaving of and return to the pig huts, selection for insemination and for slaughtering or monitoring of the animals, the entire pig stock, i.e. sows and porkers, is provided with earmarks containing

transponders. The transponders may also be equipped with means for determining and transmitting the body temperature of the pig.

Examples of different types of fields that are adapted for different groups of animals are shown on Figs. 16-20. The general idea behind the design of the field types is that it from the arrangement of feeding facilities and shelter for the pigs is ensured that a suitable part of the field is used by the pigs so that wear on the field and delivering of excrements is not concentrated on smaller parts of the full area.

Sows from 7 days before to 14 days after farrowing

The sows are moved from a field of type E, see Fig. 20, to a field 83 of type A as shown in Fig. 16, approximately 7 days before the expected farrowing, so as to let the animal get acquainted with the new surroundings. The sows may be moved by means of a transportation box and a truck, in a transportation box provided with wheels or they may walk from one field to the next. These fields 83 are each equipped with a farrowing hut 84 such as the one 16 shown in Fig. 5, and the fields 83 are arranged around a common field 85 with feeding facilities 86, such as a transponder feeding hut 28 as shown in Fig. 8 or a feeding hut 54 as shown in Fig. 11. Each field 83 is separated from the adjacent fields with a fence 87 which also encloses the field at the end away from the common field 85.

Considering the presence of piglets, the pig houses are separated from each other by a further fence 88 of a height of approximately 10 cm which has the purpose of keeping the piglets within the enclosed field. This fence 88 also prevents the piglets from entering the common field 85.

Each field 83 also comprises a mud-hole 90 placed away from the common field 85 behind the farrowing hut 84. The mud-holes 90 may be of the type shown on Fig. 15, but the environmental load on this type of fields is low and the demand for reducing this load is limited. An arrangement of the elements on the field 83 for ensuring that the whole area of the field 83 is used by the pigs is for the same reason not necessary.

The feeding facilities 86 are provided with water and electricity and both the feeding facilities 86 and the farrowing huts 84 are preferably placed in the vicinity of an access road 89.

Plenty of straw is supplied to the sow so that it may begin nest-building 2-3 days before farrowing. The sow is placed in the sow retainer 18 the last days before the farrowing, but is let out into the field 83 for one hour twice a day. The heating lamps 21 and the lights inside the hut 84 are switched on and the ventilation of the hut 84 may be reduced when the state of the sows udder indicates that the sow is about to farrow. Farrowing normally progresses without problems since the sow is in good shape due to its free-range life. However, human assistance may be required during the farrowing, e.g. if a piglet is stuck inside the sow and the sow retainer may in these cases prevent the person assisting the sow from being bidden or otherwise harmed by the sow.

The piglets, 8-16 in a litter, will soon after the farrowing learn to move under the heating lamps 21. The sow cannot enter the piglet shelter 22 or the area under the heating lamps 21 because it is fixed in the sow retainer 18, which prevents piglets from being overlaid by the sow. The sow is released from the sow retainer 18 2-3 days after the farrowing and may thereafter move freely in the hut 84. The piglets are let out into the field 83 4-10 days after the farrowing, depending on the weather. The piglets are ear marked with the sows number, receive a dose of vitamins etc. on the first day after the farrowing and the male piglets are castrated 3-7 days after the farrowing.

The sow has free access to water inside the farrowing hut 84 and is fed in the feeding hut 86. The farrowing hut 84 may accommodate two sows.

Sows with piglets until 3rd-8th week after farrowing

The sow together with its piglets are moved to a field 91 of type B, see Fig. 17, equipped with family huts 92 such as the ones 23 shown in Fig. 6, 3 weeks after the farrowing. The sows are fed in a feeding hut 93, which may be a transponder feeding hut 28 of the type shown in Fig. 8, and the piglets are fed once a day in the family hut 92. Water is supplied to both sows and piglets inside the family hut 92. A separation area 94 may be located adjacent to the feeding hut 93 for sows that for some reason, such as illness, are separated from the group of sows.

The field 91 is provided with mud-holes 95 that optionally are mobile mud-holes 76 of the type shown in Fig. 15. Waste-water from the mud-holes 95 may be let to facilities 96 for storage of the waste-water or for treatment of it, such as a constructed wetland or reedbeds.

The whole field 91 is enclosed by a fence 97 to prevent sows and piglets from leaving the field 91. The field 91 has a fence 98 arranged so that the sows are forced to pass most of the entire area of the field 91 in order to move between the family huts 92 and the feeding facilities 93. A fence 99 may be arranged around the family huts 92 and the mud-holes 76 allowing the piglets to pass but enforcing the sows to pass the mud-holes 76 when entering and leaving the family huts 92 so as to make the sows urinate and defecate in the mud-holes 96. Another fence 100 is arranged so that the piglets are prevented from entering the feeding area 101 for the sows.

The piglets are weaned six weeks after the farrowing, at which time the sows are transferred to a field of type D, see Fig. 19. The piglets stay in the family huts 92 until they reach a weight of about 25 kg. The piglets are now called porkers.

Porkers until slaughtering

The porkers are, when they have reached a weight of about 25 kg about 8 weeks after the farrowing, transferred to a field 102 of type C, see Fig. 18, at which time a transponder is fastened to one or both ear of each porker in order to provide unique

identification of the individual animal. According to the presently shown embodiment, the transponder will be fastened to the right ear. The field 102 is equipped with shelter huts 103, such as the ones 27 shown in Fig. 7 for providing shelter for the porkers. The field comprises mud-holes 104 which preferably are of a mobile type and of a construction that substantially prevents the contents of the mud-hole 104 from spilling into the environment as the mobile mud-hole 76 shown in Fig. 15. The area where the shelter huts 103 are situated also comprises a watering hut 105, e.g. of the type 51 shown in Fig. 10 and the shelter huts 103, the watering hut 105 and the mud-holes 104 are enclosed by a fence 106 to ensure that the porkers pass the mud-holes 104 when they leave the shelter huts 103, similar to the arrangement in field type B.

The field 102 comprises a separation and feeding area 107 with a separation hut 108 where the porkers are separated into the separation area 109 if they are ill, are to be slaughtered or for other reasons, or are led to the feeding huts 110, 111, 112. The porkers may in the shown embodiment be led to three feeding huts 110, 111, 112 according to their weight which is control parameter for which stage of a phase-feeding programme they belong to. This embodiment is relevant if porkers of different sizes are living together on a field 102. Alternatively, only one feeding hut 110 is required if all porkers on a field 102 are of approximately the same size. The porkers enter a closure 113 when they leave the feeding huts 110, 111, 112 from which closure they may enter the open field through a one-way gate 114.

The separation hut 108 is equipped with means for identifying each porker, such as e.g. a transponder-reading system, and may further have means for registration of when a porker passes the separation hut 108 in order to monitor the behaviour of the individual porker, means for weighting the porkers and register the weight in a registration system, means for registration of the body temperature of the porkers, means for measuring the thickness of the fat layer on the back of the porkers and/or means for marking the porkers with e.g. spray paint. The arrangement for individual feeding of animals as shown in Figs. 24-26 may be used alternatively.

The field of type C is also equipped with a fence 115 arranged so that the porkers are forced to pass most of the entire area of the field 102 in order to move between the shelter huts 103 and the separating and feeding area 107.

The number of porkers per shelter hut varies during the period from 50 porkers at the beginning to 25 porkers at the end.

Sows after weaning

The sows are after weaning placed in a field 116 of type D as illustrated in Fig. 19, where they are separated from the pregnant sows. The sows will naturally come into heat 5-7 days after weaning of the piglets. However, the free-range sows will often not come into heat by themselves in a period of the year, in northern Europe such as Denmark typically from July to December since they live out in the open, for which reason the sows are fed 2-3 times the ordinary amount of feed, are given a vitamin injection, are placed together with other sows that are about to come into heat and are optionally placed where they may see, hear and smell a boar. These changes will normally induce the sow to come into heat whereafter it is artificially inseminated twice. A number of sows are inseminated at the same time to facilitate that differences in the size of the litters may be reduced on the second day after farrowing by moving piglets from one sow to another.

The field 116 is equipped with a number of shelter huts 117, such as the ones 27 shown in Fig. 7 for providing shelter for the sows. The field 116 comprises one or more mud-holes 118 which preferably are of a mobile type of a construction that substantially prevents the contents of the mud-hole 118 from spilling into the environment as the mobile mud-hole 76 shown in Fig. 15. The shelter huts 117 and the mud-holes 118 are enclosed by a fence to ensure that the sows pass the mud-holes 118 when they leave the shelter huts 117, similar to the arrangement in field type B and C. The field may further be equipped with a shelter hut 119 and a mud-hole 120 for a boar that is not allowed to mix with the sows for which reason a fence 121 is enclosing the area for the boar. The proximity of the boar affects the sows to come into heat.

The field comprises a watering hut 122, e.g. of the type 51 shown in Fig. 10, a feeding hut 123, preferably a transponder-feeding hut, e.g. of the type 28 shown in Fig. 8, where the sows are fed according to their individual need and programme and an enclosure 124 for separated sows.

The field of type D is also equipped with a fence 121A arranged so that the sows are forced to pass most of the entire area of the field 122 in order to move between the shelter huts 117 and the feeding hut 123 and the watering hut 122.

The feeding hut 123 is equipped with means for identifying each sow, such as e.g. a transponder-reading system, and may optionally also have means for registration of when a sow passes the feeding hut 123 in order to monitor the behaviour of the individual sow, means for weighting the sows and register the weight in a registration system, means for registration of the body temperature of the sows, means for administrating medicine to the sows and/or means for marking the sows with e.g. spray paint. Further, the feeding hut 123 may have means for separating a sow due to various reasons, such as the sow being ill, the sow being in heat etc.

Pregnant sows

After insemination, the sow is transferred to a field 125 of type E as shown on Fig. 20. A number of pregnant sows are placed on the field 125 together with one or more boars and the sow will stay there for about 110 days until about one week before farrowing at which time it is moved to a field of type A, see Fig. 16.

The field 125 is equipped with a number of shelter huts 126, such as the ones 27 shown in Fig. 7 for providing shelter for the animals. The field 125 comprises one or more mud-holes 127 which preferably are of a mobile type of a construction that substantially prevents the contents of the mud-hole 127 from spilling into the environment as the mobile mud-hole 76 shown in Fig. 15. The shelter huts 126 and the mud-holes 127 are enclosed by a fence 128 to ensure that the animals pass the mud-holes 127 when they leave the shelter huts 126, similar to the arrangement in field type B, C and D.

The sows in the field 125 of type E are preferably being fed individually in a transponder feeding hut 129 according to a feeding programme, similar to the arrangement in field D with the same options as for the feeding hut 129. The feeding of the pregnant sows is very important to ensure that the piglets develop properly. The field 125 also comprises a separation area 130 and a watering hut 131. The sows in this field 125 may further be separated because the farrowing is near, about one week before. The sows are moved from here to a field of type 2 approximately a week before expected farrowing.

The field of type E is also equipped with a fence 132 arranged so that the animals are forced to pass most of the entire area of the field 125 in order to move between the shelter huts 126 and the feeding hut 129 and the watering hut 131.

Phase-feeding programme

The porkers are during a phase-feeding programme fed with typically 3-6 different types of mixed feed, the change from one type to the next being dependent on their weight. The benefit of phase-feeding is that each type of mixed feed is composed for porkers of a particular size and weight, for which reason the porker utilises an optimal amount of protein, vitamin and other nutrition in the feed. This means that a smaller amount of feed is consumed by the porker for it to reach a certain weight and that the amount of e.g. phosphor and calcium in the excrements is reduced which again means that a smaller field area is needed for receiving the excrement in order to keep the environmental load below certain limits.

The porkers are in conventional breeding systems kept in the same pigsty from they reach a weight of about 25 kg and until they are ready for slaughtering and they are all fed by the same automatic feeding system. The introduction of a phase-feeding programme requires that the pigs are either moved several times between sties with different feeding systems or that one or more additional automatic feeding system(s) is/are installed parallel to the existing system.

A phase-feeding programme is easily incorporated in the breeding system according to the invention. The porkers in one field are all of the same size so that their feeding hut

is reloaded with mixed feed of the type according to the average weight of the porkers. Alternatively, the porkers in one field are mixed in sizes and they are in the separation hut separated to two or more feeding huts according to the weight of the individual porker.

Monitoring, registration and control programmes

The monitoring, registration and control of the animals are performed with standard equipment, such as ear transponders, stationary and hand held transceivers for communicating with the transponders, means for temperature registration, means for marking the animals, means for measuring the thickness of the fat layer on the back of the porkers, weights etc. This equipment is commonly commercially available and may by purchased from a number of producers, such as Schauer (Switzerland), Laprova (Denmark) or SKIOLD datamix a/s (Denmark).

The software for controlling the necessary processes are also commonly commercially available and may be purchased from a number of producers. An example of a software producer is AgroSoft (Denmark). However, the software must be modified in order to fulfil the special demands for functioning with a highly automated free-range pig-breeding system.

Flow-charts for modifications performed according to the invention in standard software are shown in Figs. 21-23 as examples of how the required functionalities may be obtained. These modifications could be implemented in any software for monitoring, registration and/or control of animals in a breeding system.

The flow-chart in Fig. 21 illustrates a modification of a programme controlling a transponder feeding and separation system such as the one installed in the transponder feeding hut as shown in Fig. 8. The purpose of the modification is to include a new separation code for sows that are in heat which is detected by a measurement of the body temperature of the sow. The modification is given in the column beginning with "PLC reading sow temperature". The temperature of the sow is compared to the average of the body temperatures of the sows measured recently in order to compensate for variations in outdoor temperature. In case the body

temperature is more than 1.5 °C higher than the mean body temperature, the sow is deemed to be in heat and a separation code for the sow is set and it is separated, either immediately or at a later time.

The flow-chart shown in Fig. 22 illustrates a modification that is needed due to the fact that the piglets are weaned after six weeks instead of after three weeks, which is common in traditional pig-breeding systems. Therefore, the sow may come into heat before the piglets are weaned, that is between three and six weeks after farrowing. This is not an option in standard software where it is a demand for entering fertilising data that the removal of piglets have been registered.

The new functionality implemented in the software is that the sow in the period between three and six weeks after farrowing may be registered as being in heat and fertilising data may also be registered, before the registration of removal of piglets have been made.

The flow-chart shown in Fig. 23 illustrates the modifications needed to obtain a monitoring and control system for porkers that are fed according to a phase-feeding programme. Each porker is uniquely identified with a transponder and the porker is identified and the weight, and optionally the body temperature and thickness of the fat layer, is registered when the porker enters the separation and registration system, such as the system installed in the separation hut 37 shown in Fig. 9. The porker may be put on a list of porkers to be slaughtered if its weight exceeds a given limit, in this case 120 kg. Porkers on the slaughter-list may be given a separation code for slaughtering. The body temperature is compared to a mean body temperature and the porker is given a separation code for illness if its body temperature deviates more than a given limit from the mean temperature. Further, the porkers may be led to different feeding facilities according to their weight and a phase-feeding programme. The porkers may, in the example shown in Fig. 23, be separated for feeding in three groups, 25-45 kg, 45-65 kg and 65-125 kg.

The purpose of employing a monitoring, registration and separation system for porkers is also to ensure that a high quality level of the meat can be guarantied and that animals that are ill, which may be detected by deviation in temperature, declination in

growth rate or absence from feeding or by other indications, are separated for treatment or destruction. This function is also important for ensuring the well-being of the animals.

Example of breeding system for producing 1500 porkers/year

An example is given for a breeding system according to the invention for producing 1500 porkers per year. The porkers are being fed according to a phase-feeding programme with six types of mixed feed and the amount of feed is measured in the common standard Feed Unit (FU).

Feed consumption:

70 sows/boar producing 22 piglet per sow per year and eating 1320 FU/year	92,400 FU
1500 piglets from farrowing to 30 kg 2.2 FU per kg growth Free-range addition 8%	79,380 FU
1500 porkers from 30 kg to 45 kg 2.4 FU per kg growth Free-range addition 8%	58,320 FU
1500 porkers from 45 kg to 65 kg 2.7 FU per kg growth Free-range addition 8%	87,480 FU
1500 porkers from 65 kg to 125 kg 3.0 FU per kg growth Free-range addition 8%	291,600 FU
Total feed consumption/year	609,180 FU
Total feed consumption/kg porker	3.25 FU

Field area demands

The fields may, according to the present official regulations in Denmark, be loaded with 20,000 FU/hectare/year if pigs are kept on the field every second year and a nitrate-consuming crop is grown the years in between. It is also a demand that grass has been growing on the field at least one year before the pigs are let onto the field. The grass is preferably sown simultaneously with the nitrate-consuming crop. Therefore, the field area demand for the breeding system is one hectare per 10,000 FU/year since the fields may be used for keeping pigs on half of the time at the most.

The breeding system is preferably split into two parts: a first part where the sows (and boars) are kept as well as the piglets until they reach a weight of about 25-30 kg and a second part for the porkers. This first part of the breeding system has the largest need for humane interaction in connection with farrowing, insemination and tending of the piglet. The piglets are sensitive to illness etc. and may e.g. easily catch diarrhoea which raise demands for treatment and care. This first part of the breeding system has a field area demand, according to the previous calculations and numbers, of 18 hectare.

The second part of the breeding system demands much less humane interaction and is to a higher degree automatic. This part may very well be situated at a distance from the first part and may be a completely separate production unit from the first part, except that porkers are delivered from a first part to a second part. The porkers are marked with a transponder before being delivered to the second part and relevant data for the individual porker may also be delivered from the first part to the second part. The second part of the breeding system has a field area demand, according to the previous calculations and numbers, of 44 hectare.

It should be noted that the Danish official demands for field areas for free-range pigs are below the official demands of the European Union for which reason the mentioned demands probably will increase in the future. On the other hand, the demands for field area may be reduced if the mobile mud-hole is used to collect a part of the excrement from the pigs if this effect is documented properly to the relevant authorities.

A field may be used in an optimal way by dividing the field into three equal parts and moving the porkers between the three parts so that one part is used in September to December, the second part in January to April and the third part in May to August. The number of animals equals a load of 20,000 FU/hectare/year for the whole field. In this way each part is loaded with triple load but only for a third of the year and crops may be grown on two thirds of the field from May to August, thus improving the utilisation of the field.

Individual feeding

An embodiment of the invention concerning individual feeding of animals is shown in Figs. 24-26. The animals are preferably pigs and may be sows or porkers. The described methods and devices are very suitable to free-range animals living in a larger herd as well as in a minor herd.

The arrangement comprises separation equipment having a transceiver 133 for communicating with transponders in the earmarks of each of the animals for identification of the individual animals, an inlet gate 134 that is opened for an animal if the identification made by means of the transceiver 133 indicates that the animal should be fed, a scale 135 for determining the weight of the animal that have entered the separation enclosure defined by the gates 134, 137, 138, and the fence 139, a second transceiver 136 for verifying the identification of the animal, a first outlet gate 137 for providing access to the feeding carrousel 140 and a second outlet gate 138 for separating individual animals from the rest of the herd. Furthermore, the arrangement is equipped with an infra red sensor (not shown) for detecting the temperature of the skin of the animal that has entered the equipment and for communicating the measured value to a control unit.

The feeding carrousel 140 is divided with fences 141 into eight parts of a suitable size for accommodating an animal, each part comprising a feeding bowl 142 with supply for feed and optionally drinking water. The carrousel 140 on the figure is turning counter-clockwise with a rotational speed of about four turns per hour so that an animal will have seven eighths of a quarter of an hour (about thirteen minutes) to eat.

The carrousel 140 is surrounded by a stationary fence 143 that covers most of the circumference of the carrousel 140 except at the gate 137 leading to the carrousel 140 and to the left of the gate 137 at the outlet position 144 where the animals are leaving the carrousel 140. An arm 145 is provided for expelling the animals from the part being at the outlet position 144. The arm 145 is slightly curving in the horizontal plane. The fences 141 dividing the carrousel 140 and the arm 145 are formed from slats arranged so that the fences 141 may pass the arm 145, as being apparent from Fig. 26.

The arm 145 may alternatively be mounted on the centre part of the carrousel 140 or it may be constructed as a turntable with approximately the same diameter as the carrousel 140 and turning in the same direction just above the floor of the carrousel 140. The centre of the turntable is situated just outside the perimeter of the carrousel 140 so that the animal are forced to jump onto the turntable which turns the animal and move it out from the part of the carrousel.

The animals leave the carrousel 140 to an enclosure such as a part 146 of the feeding hut 147 as shown on Fig. 25. The animals may only leave the enclosure through a one-way door 148, thus assuring that the animals pass the feeding system in one direction.

The supply of feed to the feeding bowls142 may be provided from a feed container 149 arranged under the ceiling of the feeding hut, the feed being led from the container 149 through an opening 150 in the lower part of the container to the feeding bowls 142. A screw conveyor 151 measures out a specified amount of feed to the individual animal that is fed from the specified feeding bowl 142.

The arrangement has a safety system to ensure that the animals will not suffer any harm in case of a malfunction of the system. The safety system comprises means for detecting an increased load on the mechanism for driving the carrousel 140 so as to detect e.g. whether an animal has become wedged. In case such an incident or another major malfunction is detected, the safety system stops the rotation of the carrousel 140 and a valve connecting a reservoir of pressurised air with a number of pneumatic cylinders is opened, causing the gates 134, 137 to open and the fences

141 dividing the carrousel 140 into parts to be raised, thus allowing the animals within the arrangement to leave it. The control system of the arrangement is permanently or temporarily connected via communication means to a surveillance system and the safety system provides a signal to the surveillance system in case of a malfunction. The arrangement may be reset from the surveillance system in case the malfunction is remotely correctable by the surveillance system.f

The arrangement is used for controlled feeding of the individual animal of a free range herd. The animals are preferably pigs for which individual feeding is advantageous for both sows and porkers that are raised for meat production. Both sows and porkers are fed with different compositions and amounts of feed depending on a number of circumstances. The feeding of the sows depends on whether they are in heat, are pregnant, are nursing piglets, are about to farrow, etc. and the feeding of the porkers depends on their age and weight, the so-called phase feeding programme. The individual control of the feeding of the animals ensures that the stronger or more aggressive animals do not keep other animals of the herd from the feed, which for large herds of porkers ensures a more homogeneous distribution of size and weight of porkers of the similar age and a generally better well-being and health of the animals. The free-range herds of porkers of similar age or of mixed age is often large, comprising 100, 200 or even 500 or more animals.

The feeding arrangement is equipped with a control unit, such as a computer having a logical unit and memory means for storing data, input and output units and means for controlling the operation of the arrangement. The feeding arrangement is advantageously used together with computer software for carrying out a method for feeding the animals, the computer software being stored within the memory means and controlling the steps of the operation of the arrangement. The operation of the feeding arrangement for a herd of animals each having an earmark comprising a transponder for unique identification is described below. The operation of the control unit is controlled by the computer software.

The transceiver 133 registers that an earmark is present within the sensing area of the transceiver 133 and it is determined by the control unit whether the animal is to be fed or separated, in which two cases the animal is allowed into the separation

arrangement. Commonly, the animals are fed twice a day. If the animal is allowed into the separation arrangement, the inlet gate 134 is opened. When the animal has entered the enclosure and is standing on the scale 135, the second transceiver 136 registers the identity of the earmark so as to confirm the identification of the animal and to determine that the animal is placed correctly within the enclosure so that the inlet gate 134 may be closed. The weight of the animal is determined from a signal received by the control unit from the scale 135 and the weight is entered into a record of the individual animal. Optionally, the arrangement also comprises means for measuring the surface temperature of the animal by measuring the infrared radiation from the animal, and alternatively or additionally the earmark may comprise a temperature sensor and means for transferring data regarding the measured temperature to the control unit. The registration of the body temperature serves the purposes of determining whether an animal is ill or, in case of a sow, determine whether the sow is in heat. The arrangement may also comprise means for measuring the thickness of the fat layer on the back of the animals, primarily for porkers.

The control unit now determines whether the animal should be fed, in which case the outlet gate 137 to the feeding carrousel 140 is opened, or the animal should be separated due to illness, a sow being in heat, for slaughtering or for other reasons, in which case the outlet gate 138 for separation is opened. The separation arrangement may optionally comprise more than one outlet gate for separation for different reasons and purposes, or the outlet gate 138 may lead to an enclosure having a plurality of outlet gates for selective separation. The opening of the outlet gate 137 to the feeding carrousel 140 is synchronised with the angular position of the carrousel 140 so that each animal is led to an open part of the carrousel 140. The outlet gate 137 or 138 is closed and the inlet gate 134 is ready to open for another animal at a predetermined time period, e.g., 10 seconds, after the outlet gate 137, 138 is opened. The outlet gate 137, 138 does not close if the animal has not left the enclosure completely but the inlet gate 134 is opened so that the following animal will push the preceding animal out from the enclosure.

Feed is provided in the feeding bowl 142 in an amount determined by the control unit by activation of the screw conveyor 151. Optionally, the arrangement comprises more than one feed container 149 and the feed may be mixed individually for each animal.

Furthermore, a supply of drinking water may be provided within each part and means for dosing medicine into the feed for the individual animal may also be provided.

A record for each animal of the herd is kept within the memory means of the control unit. The record comprises the transponder identification number, an identification number, the day of birth of the animal, identification of sow and boar and weight at the age of 6-8 weeks. Optionally, the daily registered weight, temperature, amount of feed, the hour and minute of each daily feeding and/or the thickness of the layer of fat is also kept on record. For sows, data regarding expected heat, data regarding the day of insemination and day of expected farrowing and/or data regarding size of litter may also be kept on record.

A number significant of the utilisation of the feed, the E number, may be calculated as follows based on the recorded data:

$$E = \frac{\text{weight, day 2 - weight, day 1}}{\text{feed consumption per day * number of days}}$$

= weight unit growth per consumed weigh unit of feed

The amount of feed for porkers is determined from a table stored within the memory means of the control unit and comprising data connecting the age, normal weight and amount and mixture of feed for the animals. If the weight of an animal deviates to the lower side from the normal weight with more than a certain percentage, e.g. 5%, the amount of feed for that particular animal is increased over a period. The lower weight may be caused by illness for which reason the effect of the increased amount of feed is monitored over a period and the animal is separated from the herd if the desired effect is not achieved. The amount of feed is in general raised for all animals if the temperature is low and/or for certain combinations of temperature and wind for animals living outdoor, because it takes more energy for the animals to keep the body temperature up. The amount of feed is typically raised with 5% due to cold weather but the amount of feed may be adjusted to more than one other level so that a more precise adaptation to the environment of the animals may be made.

The control unit is preferably connected to a surveillance system via a private or public communication network or a combination thereof. The communication between the person or persons who look after the free-range breeding arrangement and the herd of animals will most often take place via the network. The control unit may prepare operating reports to the surveillance system with a predetermined interval and/or on demand, and reports regarding malfunctions of the system are sent to the surveillance system. An operating report may comprise data regarding the individual animal and statistical data about the number of animals within a weight interval, the temperature of the animals, etc. The statistical data from the control unit may advantageously be used for optimising the raising of the porkers with regard to amount and composition of feed, compensation for change of type of feed, for monitoring the effect of changes in the physical environment of the animals, such as the huts, the area of the field, the arrangement on the field, etc.

The separation of animals for slaughtering is typically performed by communicating the number of animals of a given weight that is desired to be separated from the herd to the control unit prior to the actual fetching of the animals, e.g. twelve hours before. Alternatively or additionally, the animals for slaughtering may be chosen due to another parameter such as the thickness of the fat layer on the back of the animal, the time period in which the separation is to take place, based on the registered habits of the animals, the E number of the animals, etc.. The control unit then selects the desired number from the animals passing the separation unit and separates these animals to an enclosure provided with drinking water. The progress of the separation process may be monitored at distance via the communication network. The control unit corrects the records on the herd after the animals for slaughtering have been fetched and the data regarding the separated animals may be transferred to the surveillance system so that the data may follow the animals/the meat, optionally all the way to the consumer. In an alternative approach, information is requested from the control unit regarding how many animals of a given size that may be separated within a given time period and the number is predicted based on the registration of the habits of the individual animal. A list of the animals chosen for separation may be supplied from the control unit to the user for manually editing of the list an returning it to the control unit.

A separation command given to the control unit could as an example comprise:

the breeding unit within a larger system from which the animals should be selected,

the feeding unit(s) within the breeding unit to separate from,

the number of animals,

the time period in which the animals should be separated,

the date on which the separation should take place,

the weight range of the animals,

the thickness range of the fat layer on the back of the animals,

the upper limit of the registered temperatures of the animal within a given time range,

the outlet to which the animals should be separated.

The control unit may also be connected with equipment for providing pictures and/or sound from one or more locations of the breeding system and in particular for the separation and feeding arrangement and for transferring these recordings to the surveillance system.